

[54] LOCKING SYSTEM

[75] Inventor: Albert J. Mazeika, Philadelphia, Pa.

[73] Assignee: Eugene H. Clement, Hi-Gene Laundry Co., Overbrook Hills, Pa.

[22] Filed: Mar. 15, 1974

[21] Appl. No.: 451,467

[52] U.S. Cl. .... 70/85; 70/262; 70/282; 232/12

[51] Int. Cl.<sup>2</sup> ..... E05B 65/44

[58] Field of Search ..... 70/85, 87, 262, 277, 278, 70/282, DIG. 46; 232/1 D, 12; 312/333

[56] **References Cited**  
**UNITED STATES PATENTS**

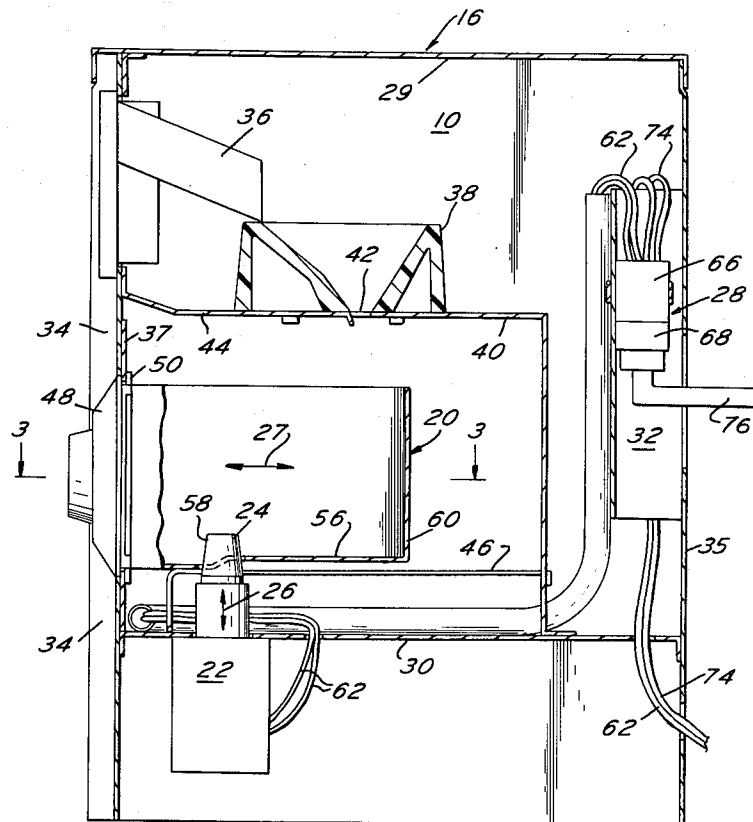
2,145,314	1/1939	Murtaugh .....	70/85
3,036,297	5/1962	Simjian .....	340/274
3,134,254	5/1964	Richard .....	70/277
3,347,072	10/1967	Rose .....	70/277
3,411,046	11/1968	Swannick .....	317/134
3,686,659	8/1972	Bostrom .....	340/274
3,795,417	3/1974	Cohen .....	292/144

Primary Examiner—Albert G. Craig, Jr.  
Attorney, Agent, or Firm—Maleson, Kimelman, and Ratner

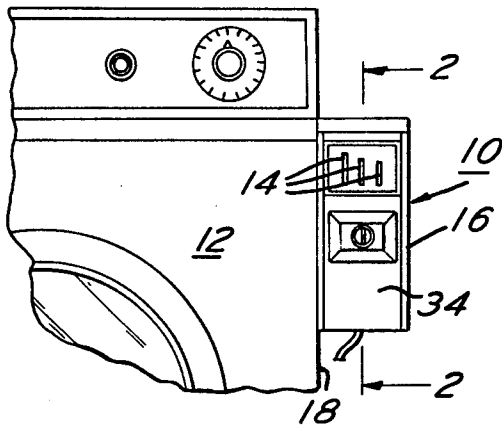
[57] **ABSTRACT**

A locking system which may be attached to a coin operated appliance for protecting money being stored in a compartment of the system from unauthorized removal. The locking system includes a housing which may be secured to the appliance. Coins inserted into the housing are transported to a compartment which is releasably secured to the housing. A solenoid lock mechanism fastened to the housing has a movable plug member which passes through a wall member of the compartment to secure the compartment to the housing until the solenoid lock mechanism is actuated. Upon actuation of the solenoid, the plug member is retracted from the compartment and the compartment may be removed from the housing. The solenoid is actuated by a switching device which includes a pair of contact blocks having a multiplicity of positionally alignable contacts. When the proper contacts are mated, a circuit coupled to a power source is completed and the solenoid is actuated to release the compartment. If the power source is turned off or the proper contacts are not mated to each other, the compartment remains secured to the housing.

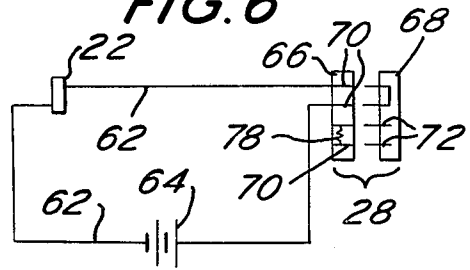
10 Claims, 6 Drawing Figures



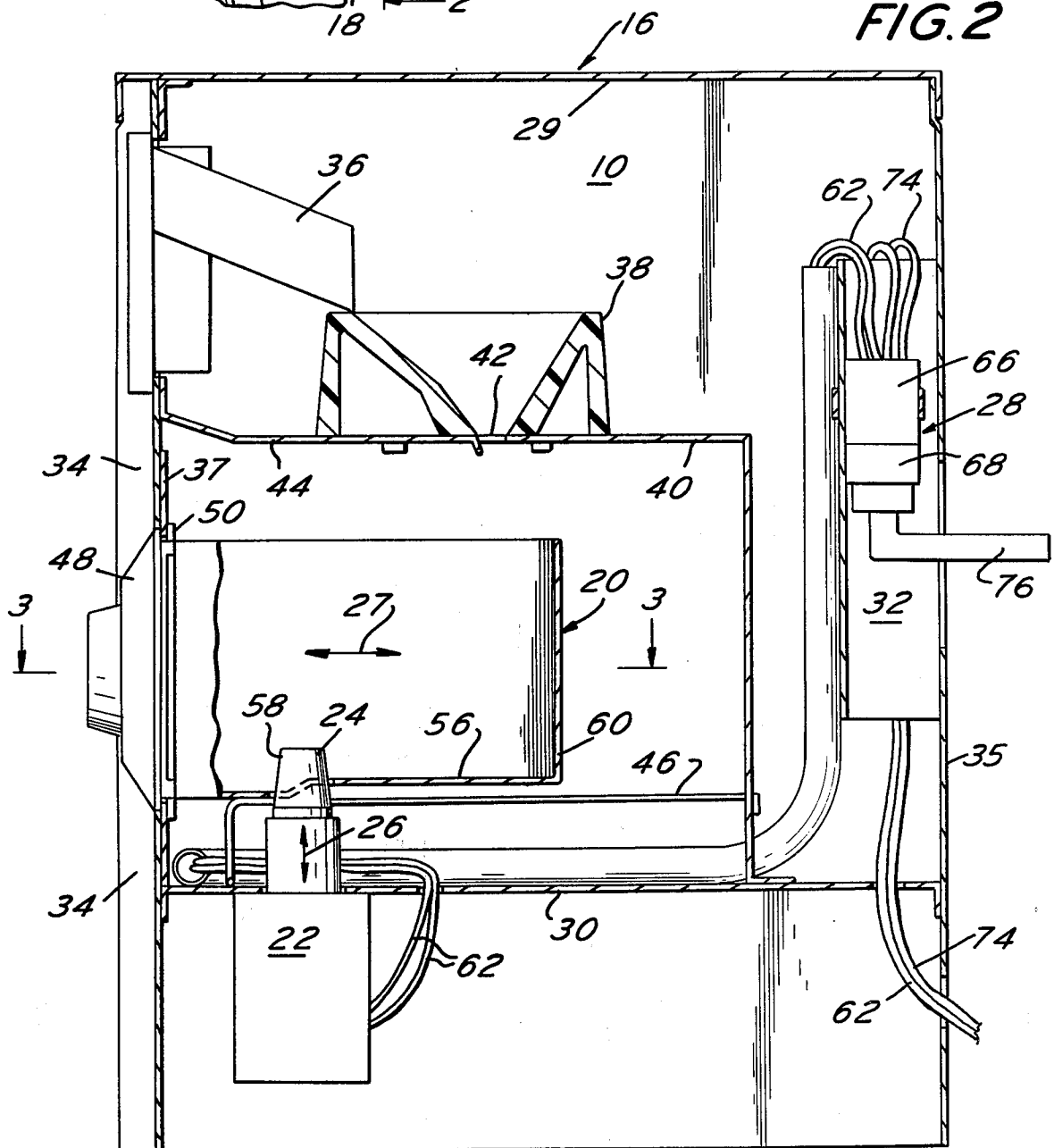
**FIG. 1**

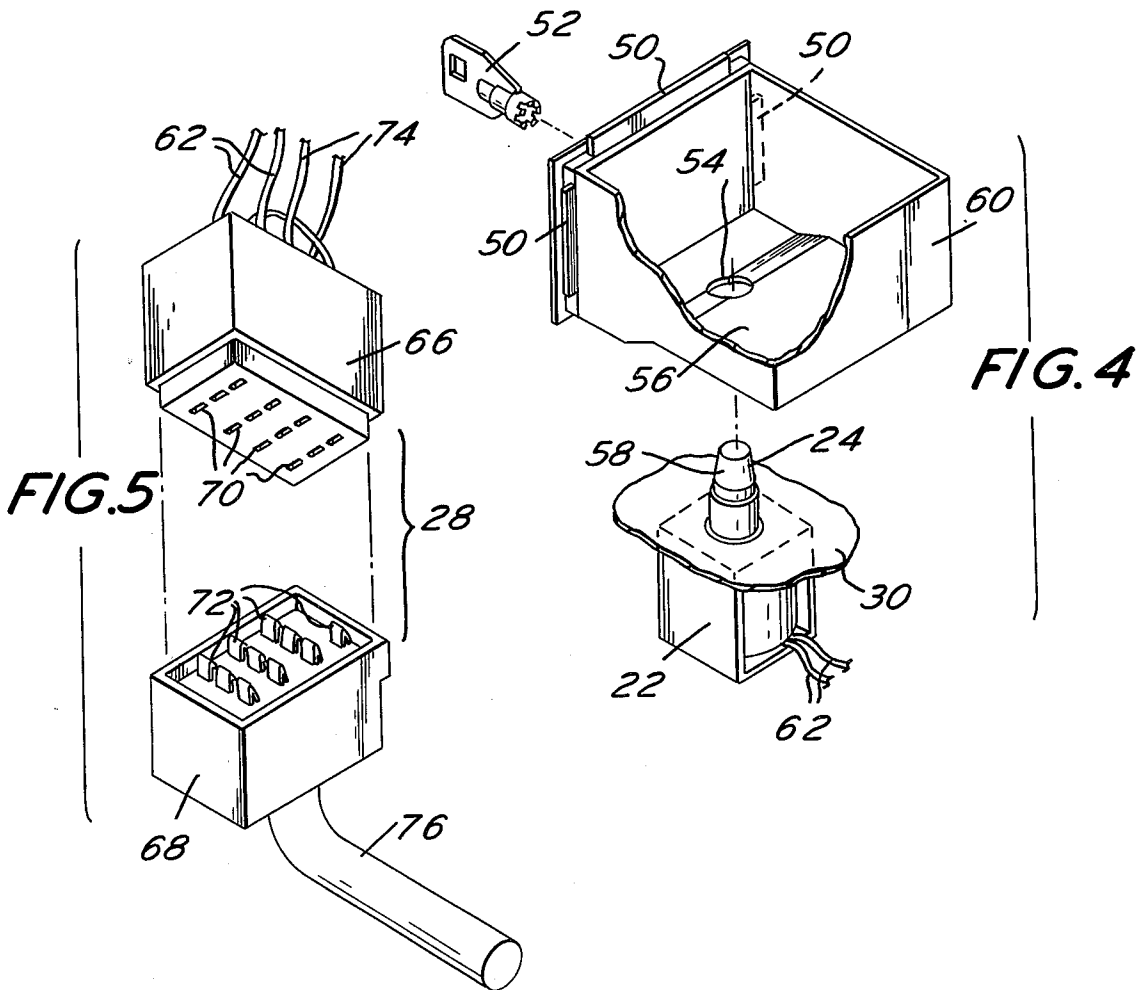
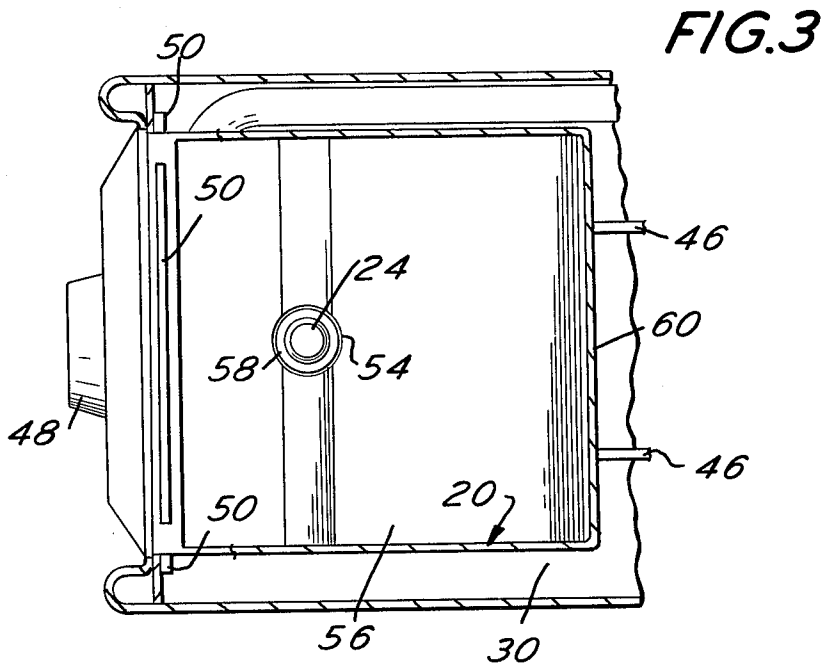


**FIG. 6**



**FIG. 2**





## LOCKING SYSTEM

### BACKGROUND OF THE INVENTION

#### 1. Field of the Invention

This invention pertains to the field of locking systems. In particular, this invention relates to the field of solenoid lock mechanisms for securing a storage compartment within a housing. More in particular, this invention pertains to the field of solenoid lock mechanisms which may only be actuated to unlock a compartment through use of a switching mechanism having predetermined mutually matable contacts. Further, this invention relates to a locking system having both mechanical and electrical locking mechanisms.

#### 2. Prior Art

Locking systems for securing compartments within housings are known in the art. Further, locking systems for locking coin collecting drawers are also known in the art. However, in some of the prior systems, the drawers are locked through mechanical locking devices having latches which constrain the drawer or compartment to a fixed housing. In such cases, the mechanical locks may be jimmied by use of a crowbar or other such implement. Once the mechanical lock is broken, the drawer is free to be removed from the housing. The use of such prior systems permits easy access to a locked compartment within a short period of time.

In other prior systems solenoid locking mechanisms are used. In some of the prior solenoid locking systems, the insertion of a circuit closing contact permits release of a compartment from a locked condition. In such systems, an unauthorized entrant only must insert an electrically conductive key to complete the opening sequence. Such prior systems do not rely on a particular combination of electrical contact points being mated to complete a circuit which releases the locked compartment. Thus such prior systems do not rely on a particular combination of mutually matable contact opening elements and the time for opening the locked compartment is short.

Other prior art solenoid locking mechanisms, in some cases, only provide for a locking condition when a power source is coupled into the solenoid circuit. In such cases when the power source is turned off, the compartment is unlocked and removable from an enclosing housing. Thus, in such prior systems, the power source may be turned off and the compartment easily removed.

In other prior art solenoid locking mechanisms, the solenoid is visible external to the housing. In such cases, the unauthorized entrant may simply jimmy or otherwise remove the solenoid locking mechanism from the housing, thereby unlocking the compartment.

In some prior systems, where only a mechanical lock, or a solenoid lock is used, once the unauthorized entrant has removed one type of lock, the storage compartment is opened. This permits a shortened entrance time over and above the time needed to gain access if both a mechanical lock and solenoid lock were to be used in combination.

### SUMMARY OF THE INVENTION

A locking system includes a housing and a compartment member which is insertable within the housing. A solenoid lock mechanism is secured to the housing. The solenoid lock mechanism has a plug member which is

retractably insertable within the compartment member for rigidly securing the compartment member to the housing until the solenoid lock mechanism is actuated. A switch device having a pair of contact blocks actuates the solenoid lock mechanism. Each of the contact blocks has a plurality of positionally alignable contacts to complete a circuit coupled to a power source for actuating the solenoid lock mechanism when the contact blocks are contiguously mated each to the other.

### BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is an elevational view of the locking system connected to an appliance;

FIG. 2 is a sectional view of the locking system taken along the section lines 2—2 of FIG. 1;

FIG. 3 is a sectional view of the compartment member taken along the section lines 3—3 of FIG. 2;

FIG. 4 is an exploded perspective view of the compartment member and the solenoid lock mechanism;

FIG. 5 is a perspective view of the switching device showing the pair of contact blocks; and

FIG. 6 is a schematic circuit diagram for the locking system.

### DESCRIPTION OF THE PREFERRED EMBODIMENTS

Referring now to FIGS. 1 and 2, there is shown locking system 10 to protect money or other valuables inserted therein against unauthorized entry. As shown, locking system 10 may be secured to a washing machine or other appliance 12 to permit utilization of appliance 12 for some specific purpose when coins or other consideration are inserted into coin slots 14 as indicated in FIG. 1. Locking system 10 may generally be used in conjunction with standard actuating and timing mechanisms for appliance 12 which permit use thereof for a specific time interval. However, the operation and structure of such timing and actuation mechanisms are not important to the inventive concept as herein detailed.

In overall concept, system 10 provides a combined electrical and mechanical locking operation which provides for increased security of valuables against unauthorized removal. As will be discussed in detail in following paragraphs, system 10 visibly appears to employ a standard mechanical locking mechanism to prevent entry. However, once the mechanical lock mechanism is breeched, an independently operated electrical locking system maintains system 10 in a locked condition to further prevent entry.

Locking system 10 includes a generally closed wall housing 16 mounted to appliance wall 18 as shown in FIG. 1. Compartment or drawer member 20 used for the collection and storage of coins is slideably insertable within housing 16 as is shown in FIGS. 2 and 3. Solenoid lock mechanism 22 is mounted to housing 16 in order to permit plug member 24 to releasably capture compartment or drawer member 20 by insertion and retraction of plug 24 through opening 54 formed in compartment floor 56. Movement or displacement of plug member 24 in reversible direction 26 is controlled through switching device 28 as shown in FIGS. 2 and 5 and to be herein detailed in following paragraphs.

Housing 16 in overall geometric contour forms a generally closed structure having housing forward wall 34 and rear wall 35 joined to opposing ceiling and floor members 29 and 30 as shown. Solenoid lock mecha-

nism 22 is rigidly secured to housing floor 30 through bolts, screws or some like mechanisms. Thus, solenoid lock mechanism 30 is rigidly constrained to housing 16 and immovable with respect thereto with the exception of vertically movable plug 24. Further as is shown in FIG. 2, housing 16 may include insert portion 32 positionally located opposite housing face wall 34 where switching mechanism 28 may be mounted within housing insert 32 in a manner such that switching mechanism 28 is not readily observable when locking system 10 is viewed from a forwardly directed position.

In general operation, coins are inserted in appropriate coin slots 14 located on housing face or forward wall 34 in order to operate appliance 12. The coins are transported through housing chute 36 by gravity assist and pass to coin funnel member 38 mounted in secure manner on inner frame 40 as is shown in FIG. 2. Inner housing frame 40 is rigidly fastened to housing 16 through weld joints, bolting, or some like technique. Inner frame upper wall 44 includes coin opening 42 of sufficient size such that the coins passing through coin funnel 38 may be transported to compartment or drawer 20 by gravity assist.

Compartment member 20 is generally box shaped in overall contour having an open top section to permit coins passing through coin opening 42 to enter and be stored. Compartment member 20 is slideably insertable within housing 16 in longitudinal direction 27 to an extended depth such that inserted coins may be captured therein. In the specific structure shown in FIG. 2, compartment 20 slides on a pair of guide rails 46 which extend in longitudinal direction 27 in order to provide a guide for compartment member 20 when it is displaced longitudinally with respect to inner housing 40. However, the specific support or displacement guide for compartment 20 is not important to the inventive concept as is herein detailed.

Mechanical lock 48 is mounted to front face or panel 34 of compartment or drawer member 20. Mechanical lock 48 may be of the standard type, well-known in the art being operated by a cylinder lock to actuate a plurality of latches 50 upon rotation of key member 52 as is clearly shown in FIG. 4. One such type of lock which may be used is manufactured by H. Greenwald Co., Inc., Brooklyn, N.Y. After insertion of drawer 20 into inner housing frame 40, key 52 may be rotated through a predetermined angle to cause extension of latches 50 from the side walls of compartment member 20. The extended latches 50 pass internal to housing 16 and are blocked by panel section 37 of housing face wall 34 as is shown in FIG. 2, thereby preventing removal of drawer 20 from within housing 16. Actuation of lock 48 as herein described, provides for a mechanical constraint of compartment or drawer 20 within housing 16. It is to be noted that when housing 16 is observed from a frontal position, the only apparent means of locking is through mechanical lock 48.

Solenoid lock mechanism 22 is secured to housing floor 30 as is shown and is immovable with respect thereto. Solenoid lock 22 includes plug member 24 which is retractably insertable into compartment 20 through opening 54 in compartment floor 56. Plug member 24 is spring loaded to provide an extended length passing through compartment floor 56 and internal to drawer 20 when solenoid lock 22 is not actuated or energized. Thus movement of drawer 20 in longitudinal direction 27 is constrained by plug 24 bearing against floor 56. Upon energization of solenoid lock 22,

plug member 24 is retracted below compartment floor 56 to permit egress of drawer 20 from within inner housing frame 40. Plug 24 includes tapered side walls 58 which aid in the insertion of drawer 20 within housing 16 when solenoid mechanism 22 is de-energized. When solenoid lock mechanism 22 is de-energized plug member 24 positionally extends above the plane of compartment floor 56. When drawer 20 lies wholly or partially external to housing 16, it may be moved into a locking position by longitudinal insertion of drawer 20 into inner housing frame 40 until compartment rear wall 60 strikes tapered plug side walls 58 wherein the tapered side walls cause a vertical force to be applied to plug member 24. This vertically directed contact force results in plug 24 being downwardly moved until it is out of the intersecting path of the longitudinal movement of drawer 20 causes plug 24 to be slideably moved along the underside of compartment floor 56 until opening 54 is reached wherein the spring loaded plug member 24 is forced through opening 54 to lock drawer 20 in predetermined position within inner housing frame 40.

Solenoid lock mechanism 22 actuated independently of mechanical lock 48, is electrically connected to switching mechanism 28, as well as power source 64, which for example, may be a standard 110 volt, 60 cycle, single phase house current source. Switching mechanism 28 clearly shown in FIGS. 2, 5 and 6 is provided for actuating solenoid lock mechanism 22. Switching mechanism 28 includes a pair of contact blocks 66, 68 for providing coupling of power source 64 to complete the circuit shown in FIG. 6 and allow actuation of solenoid lock mechanism 22. Actuation of solenoid lock mechanism 22 retracts plug member 24 from within opening 54 of compartment 20 to a position below compartment floor 56. This defines an unlocked state for solenoid lock 22 and drawer 20 may be removed from housing 16 provided that lock 48 is in an unlocked state.

First contact block 66 is electrically connected to solenoid lock mechanism 22 through leads 62 and structurally secured to housing frame 16 within housing insert 32 as is shown. First contact block 66 has a plurality of contact members 70 which are positionally alignable with a plurality of second contact block conductors 72 as is shown in FIG. 5. In the embodiment as shown, first contact block 66 constitutes a female block member and second contact block 68 is shown as a male member such that second contact block conductors 72 are insertable within openings in first contact block 66 in order that electrical contact be made between conductor 72 and contacts 70. However, such is not important to the inventive concept as herein detailed with the only exception being that upon interface between contact blocks 66 and 68 that a completed circuit be accomplished.

In order to complete the circuit as shown in FIG. 6, at least two of first contact block contacts or conductors 70 are electrically connected to solenoid lock mechanism 22 through respective leads 62 and 74. Second contact block 68 includes at least two conductors 72 which are electrically connected each to the other and contactable with the electrically connected first block contacts 70 in order to complete a circuit and provide energization for solenoid lock mechanism 22. As can be seen when second contact block 68 is inserted within first contact block 66, electrically active contacts 72 and 70 are forced into registerable contact

in order to complete the circuit of FIG. 6 and actuate solenoid lock mechanism 22. Thus by completion of the circuit with the power source 64 on, plug member 24 may be retracted forcing solenoid lock mechanism 22 to an unlocked state. It will further be noted that second contact block 68 may include a handle 76 which aids in the manual insertion of conductors 72 into intimate contact with contacts 70.

It will be further understood that resistances of predetermined resistance value may be connected to various first contact block contacts 70 which are not operable in the circuit. The resistances 78 when inserted will provide for an electrical reading between various contacts 70 upon insertion of an ohmmeter probe. Such a reading may disguise and provide inaccurate information as to which contacts 70 are applicable to the completion of the circuit and actuation of solenoid lock mechanism 22. Additionally, contacts 72 may be positioned in a predetermined manner such that insertion of second block 68 into the first block 66 may be accomplished when only a predetermined positional relation exists between block 66 and 68. Thus it will be seen that where the positional orientation of contacts 72 is not symmetrical with respect to orientation, that the insertion of contacts 72 into contacts 70 may only be performed when the block 66 and 68 are oriented with respect to each other in a predetermined manner.

In accordance with the actuation of the solenoid lock mechanism 22 concept as herein detailed, the following Truth Table provides for solenoid lock 22, plug member 24 and relating conditions with respect thereto as a function of the power "on" or power "off" condition of power source 64:

TRUTH TABLE

CONTACT BLOCKS (66, 68)	POWER SOURCE (64)	SOLENOID MECHANISM (22)	PLUG MEMBER (24)	DRAWER (20) CONDITION
Coupled	On	Energized	Retracted	Unlock
Decoupled	On	De-energized	Extended	Locked
Coupled	Off	De-energized	Extended	Locked
Decoupled	Off	De-energized	Extended	Locked
Coupled (Circuit Not Completed)	On	De-energized	Extended	Locked
Coupled (Circuit Not Completed)	Off	De-energized	Extended	Locked

It is to be further understood that the locking condition of system 10 may be easily changed by removal of a first set of blocks 66, 68 and the substitution of a second mating set. Further, with the use of a plurality of contacts 70 and 72, as shown in FIG. 5, a large number of completing circuit contact combination possibilities may be realized. Thus, an unauthorized individual may use excessive time in laboriously trying to complete the circuit by connecting all of the possible combinations of contacts 70.

While a specific form of the improved locking system 10 has been described and illustrated herein, it is to be understood that the same may be varied, within the scope of the appended claims, without departing from the spirit of the invention.

What is claimed is:

1. A locking system comprising:

(a) a housing having a frontal and rear portions;

(b) a compartment member insertable within said frontal portion of said housing;

(c) mechanical lock means mounted to said compartment member, said mechanical lock means having a latch member insertable within said frontal portion of said housing for capturing said compartment member within said housing when said mechanical lock means is in a locked position;

(d) solenoid lock means being secured to said housing, said solenoid lock means having a plug member retractably insertable through a floor member of said compartment member until said solenoid lock means is actuated; and

(e) switch means for actuating said solenoid lock means independent of said mechanical lock means, said switch means including a pair of contact blocks, each of said contact blocks having a plurality of positionally alignable contacts to complete a circuit coupled to a power source for actuating said solenoid lock means when said contact blocks are contiguously mated each to the other, said switch means mounted in said rear portion of said housing in remote positional relation to said mechanical lock means.

2. The locking system as recited in claim 1 wherein said switch means includes:

a. a first contact block electrically connected and secured to said solenoid lock means; and

b. a second contact block being removable from said locking system.

3. The locking system as recited in claim 2 wherein said first contact block includes at least two of said contacts being electrically connected to said solenoid lock means.

4. The locking system as recited in claim 3 wherein at least two of said first contact block contacts are electrically connected each to the other by a resistance element having a predetermined resistance value.

5. The locking system as recited in claim 3 wherein said second contact block includes at least two of said second block contacts being electrically connected each to the other and contactable with said electrically connected first block contacts for completing said circuit.

6. The locking system as recited in claim 3 wherein said second block contacts are contactable to said first block contacts in a predetermined respective orientation in order to complete said circuit.

7. The locking system as recited in claim 1 wherein said plug member of said solenoid lock means constrains motion of said compartment member inserted within said housing when said power source is decoupled.

8. The locking system as recited in claim 7 wherein said plug member of said solenoid lock means constrains motion of said compartment member inserted within said housing when said circuit is electrically open.

9. The locking system as recited in claim 1 wherein said plug member is inserted through a wall of said compartment member for securing said compartment member to said housing when said solenoid lock means is de-energized.

10. The locking system as recited in claim 9 wherein said plug member is retracted from said wall of said compartment member when said solenoid lock means is actuated.

\* \* \* \* \*